New Block and Gradient Copolymers by Controlled/Living Radical Polymerization

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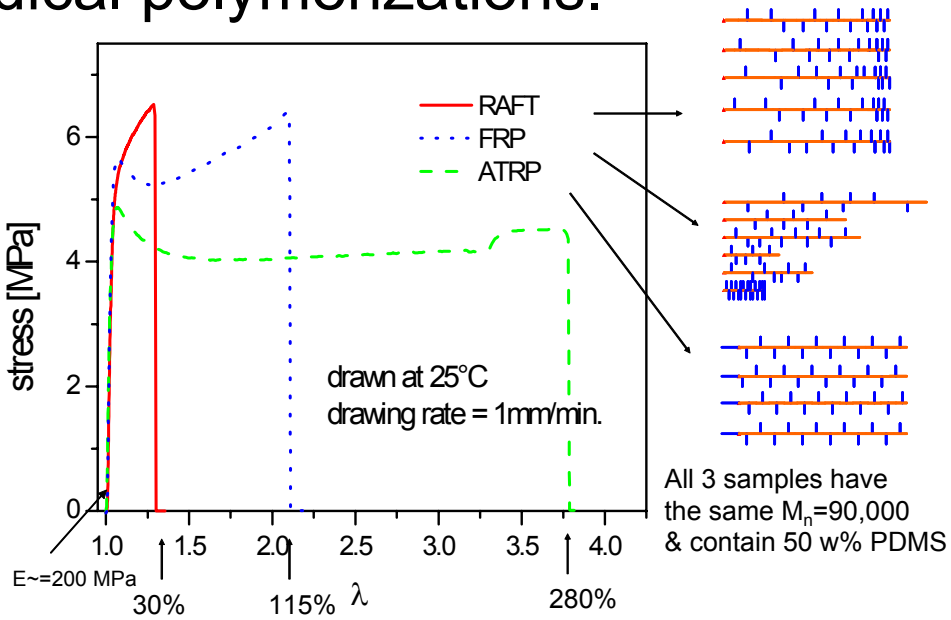
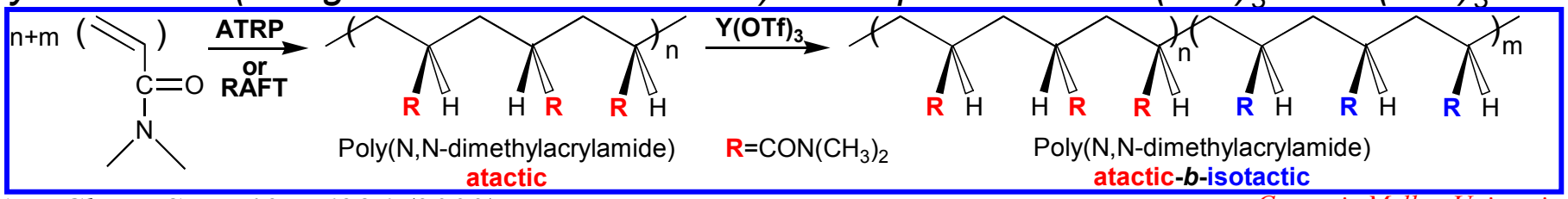
New block, graft and gradient copolymers were prepared by atom transfer radical polymerization (ATRP) and other controlled/living radical polymerizations.

- *The first example is the synthesis of graft copolymers consisting of poly(methyl methacrylate) backbone with poly(dimethylsiloxane) side chains. Figure 1 demonstrates a dramatic effect of molecular structure on the tensile properties of copolymers with the same overall composition (~ 50% w PDMS) and the same molecular weight (M_n~90,000)*

Macromolecules, 36, 4772 (2003)



- *The second example is the first stereoblock copolymer prepared by radical polymerization (using both ATRP and RAFT) in the presence of $Y(OTf)_3$ or $Yb(OTf)_3$*



J. Am. Chem. Soc., 125, 6986 (2003)

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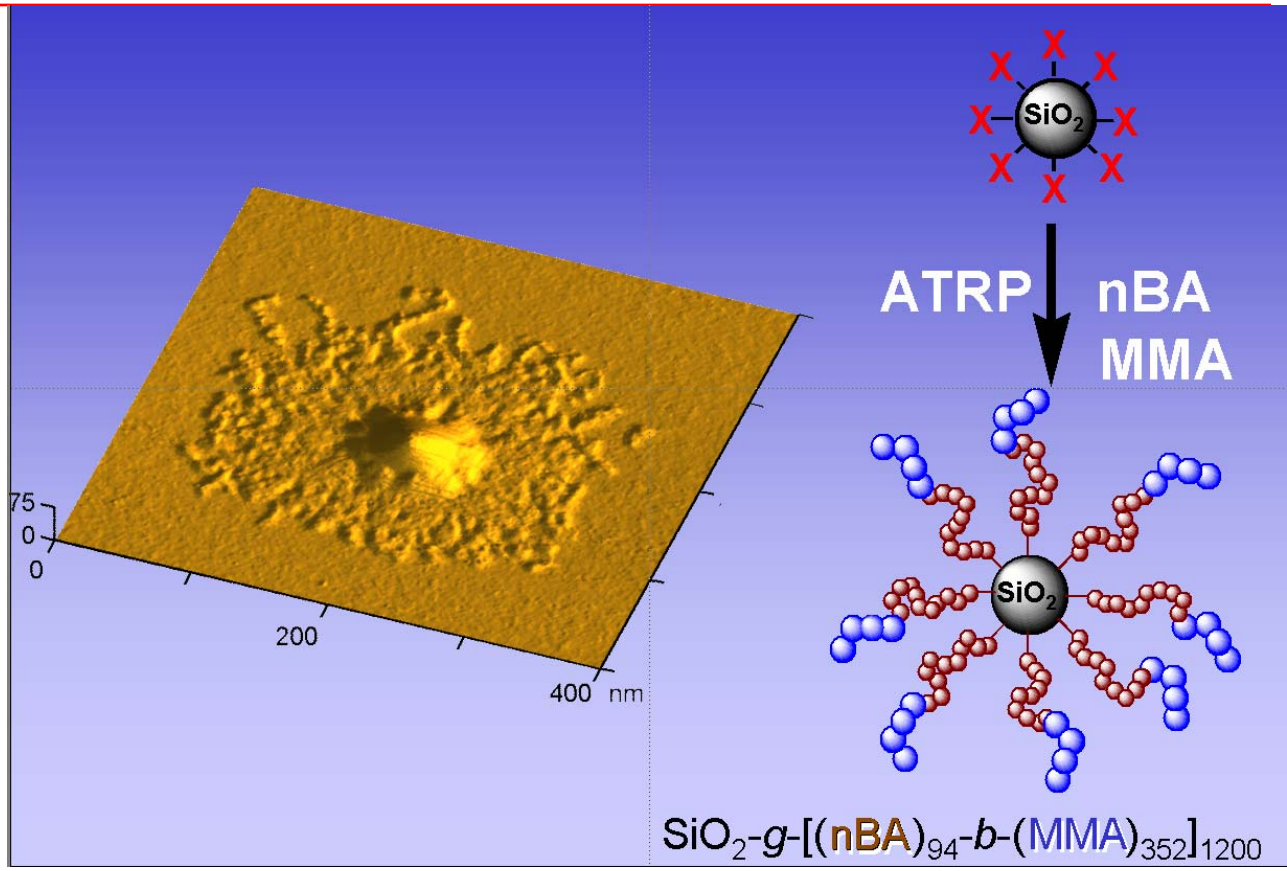
- *The third example is the block copolymerization from silica nanoparticles (d~20 nm) with ~1000 2-bromoisobutyrate initiating groups attached covalently to the surface. The ATRP allows precise control of the dimensions of the first poly(butyl acrylate) block and subsequently the second poly(methyl methacrylate) block.*



Education and Outreach:

-4 graduate students (Tsarevsky, Tang, Kirci, Pyun), 2 postdocs (Chung, Iovu) and 3 undergraduates (McKenzie, Lee, Wojtyna) contributed to this project.

-2 papers were published in "J. Chem. Ed." in 2001 on block copolymers by ATRP

-ACS symposium on CRLP was organized in Boston, 2002

-3 books were published by Wiley, ACS and Springer in 2003 and 2003